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NORMS AND CORRELATES OF THE WATSON-GLASER CRITICAL THINKING APPRAISAL AND SELECTED VARIABLES FOR NEGRO COLLEGE STUDENTS

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EDWARD C. F. CHANG

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1969

NORMS AND CORRELATES OF THE WATSON-GLASER CRITICAL THINKING APPRAISAL AND SELECTED VARIABLES FOR NEGRO COLLEGE STUDENTS

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TABLE OF CONTENTS

		Page
LIST OF TABLES		v
Chapter		
I.	THE PROBLEM	1
	Background and Need for the Study	1
	Justification of the Study	3
	Statement of the Problem	4
	Purpose of the Study	5
	Assumptions and Limitations	5
	Organization of the Study	6
II.	REVIEW OF RELATED LITERATURE	7
	Nature and Conceptions of Critical Thinking	7
	Critical Thinking and Related Factors	12
III.	DESIGN AND PROCEDURE OF THE STUDY	22
	Sampling Procedure	22
	Description of the Subjects	23
	Description of the Instruments	25
	Statistical Treatment of Data	30
IV.	PRESENTATION AND ANALYSIS OF DATA	31
	Comparisons of Mean Values on the WGCTA Test	31
	Comparisons of Mean Values on the Dogmatism Scale and the Test of Independence of Judgment	35
	Correlational Analysis of the Subtest and Total Scores on the WGCTA and Selected Variables	39
	Norms of the WGCTA and Other Normative Data	51

Page

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS. . . 67

BIBLIOGRAPHY 72

APPENDIX 77

LIST OF TABLES

Table		Page
1.	Numbers and Percentage of Parental Education of Negro College Students.	24
2.	Mean Scores, Standard Deviations, and Differences in Means of Scores on the WGCTA for Freshman and Sophomore Samples with Sex Combined	32
3.	Mean Scores, Standard Deviations, and Differences in Means of Scores on the WGCTA for Male and Female Students	34
4.	Comparisons of Differences in Means on the WGCTA Between Remedial and Nonremedial Students	35
5.	Comparisons of Mean Differences in Dogmatism and Independence of Judgment Between Nonremedial Males and Nonremedial Females	36
6.	Comparisons of Mean Differences in Dogmatism and Independence of Judgment Between Remedial Males and Remedial Females	37
7.	Comparisons of Mean Differences in Dogmatism and Independence of Judgment Between Nonremedial Males and Remedial Males	37
8.	Comparisons of Mean Differences in Dogmatism and Independence of Judgment Between Nonremedial Females and Remedial Females . . .	38
9.	Intercorrelations of Critical Thinking Scores and Selected Variables for Nonremedial Males.	42
10.	Intercorrelations of Critical Thinking Scores and Selected Variables for Nonremedial Females.	43

Table		Page
11.	Intercorrelations of Critical Thinking Scores and Selected Variables for Remedial Males.	45
12.	Intercorrelations of Critical Thinking Scores and Selected Variables for Remedial Females	46
13.	Z Transformations of the Differences in Correlations Between Nonremedial Males and Nonremedial Females	47
14.	Z Transformations of the Differences in Correlations Between Remedial Males and Remedial Females.	48
15.	Z Transformations of the Differences in Correlations Between Nonremedial Males and Remedial Males.	49
16.	Z Transformations of the Differences in Correlations Between Nonremedial Females and Remedial Females	50
17.	Percentile Ranks Corresponding to Critical Thinking Appraisal Total Raw Scores	56
18.	Percentile Ranks Corresponding to Critical Thinking Appraisal Inference Subtest Scores.	57
19.	Percentile Ranks Corresponding to Critical Thinking Appraisal Assumption Subtest Scores.	58
20.	Percentile Ranks Corresponding to Critical Thinking Appraisal Deduction Subtest Scores.	59
21.	Percentile Ranks Corresponding to Critical Thinking Appraisal Interpretation Subtest Scores.	60
22.	Percentile Ranks Corresponding to Critical Thinking Appraisal Argument Subtest Scores.	61

Table Page

23. Summary of Critical Thinking Appraisal Form ZM Subtest and Total Raw Scores for Freshman Students 62

24. Summary of Critical Thinking Appraisal Form ZM Subtest and Total Raw Scores for Sophomore Students 63

25. Summary of Critical Thinking Appraisal Form ZM Subtest and Total Raw Scores for Male Students 64

26. Summary of Critical Thinking Appraisal Form ZM Subtest and Total Raw Scores for Female Students 65

27. Summary of Critical Thinking Appraisal Form ZM Subtest and Total Raw Scores for Freshman and Sophomore Students 66

CHAPTER I

THE PROBLEM

Background and Need for the Study

Contemporary society is rapidly changing and tending toward greater complexity in all facets of human life. Never before in history has man's thinking been so challenged; neither has he been so constantly confronted with controversial issues and propaganda. While diverse ideas must be tolerated, it is apparent that a democracy can be sustained only when its citizens are able to exercise the higher thought processes and judge pertinently and discriminatingly. Therefore, development of the ability to think critically is generally recognized as an essential attribute of any citizen in a democratic society. With regard to its importance, the Educational Policies Commission had this to say:

> The rational powers of the human mind have always been basic in establishing and preserving freedom. In furthering personal and social effectiveness they are becoming more important than ever. They are central to individual dignity, human progress, and national survival.
>
> . . . . . .
>
> The purpose which runs through and strenthens all other educational purposes--the common thread of education--is the development of the ability to think . . . (2)

Dewey (15) insisted that the intellectual aspect of education consisted of the formation of "wide-awake, careful, thorough habits of thinking." To him, the business of education was therefore to:

> . . . cultivate deep-seated and effective habits of discriminating tested belief from mere assertions, guesses, and opinions; to develop a lively, sincere, and open-minded preference for conclusions that are properly grounded, and to ingrain into the individual's working habits methods of inquiry and reasoning appropriate to the various problems that present themselves.

Although critical thinking is generally regarded as one of the most important educational aims, there is abundant evidence which indicates that progress toward this goal has been quite slow. Taba (61) pointed out that little had been done in developing critical thinking in adolescents and young people. Good (28) likewise critized that the schools' demands for conformity accounted for the lack of progress. In recent years, development of thinking continues to be neglected in the school curriculum. (52)

Slow progress in the improvement of critical thinking habits is also reflected by the dearth of research in this area. Ennis (23) estimated that on the average, less than two studies a year are published on this topic. Russell (55) knew of no book in child psychology that devoted a chapter to critical thinking. Signori (59) pointed out that personality and critical thinking are not frequently related to one another in the psychological literature. He insisted that

there is an essential dependency of thinking upon personality processes. The lack of improvement in thinking, according to him, can be ascribed to the little concern for influences of personality factors. A lack of suitable devices to measure critical thinking was suggested by Edwards (19) to account for the slow improvement in thinking ability.

More research needs to be done with regard to the improvement of critical thinking. The present investigation is an attempt to meet this demand.

Justification of the Study

The institution at which the present study was conducted was concerned with strengthening the effectiveness of its general education program as well as with the improvement of its remedial program. This necessitated identification of those factors which hinder or facilitate the teaching and learning processes. Since thinking is essential to learning, the quality of critical thinking of the students and its relationship to other variables was subjected to investigation.

An overview of related literature revealed that no study pertaining to critical thinking has been made using Negro subjects. The extent to which most of the research findings could be generalized to Negro students might be very limited in view of the substantial differences in cultural and educational background that characterize the Negro population. Of extreme importance is that test norms relevant to

the Negro population were not always available. Consequently, the results of such research may not always be interpreted without special provisions and reservations. It follows that norms should be provided and developed in order that a meaningful interpretation of test scores and research results may be achieved.

The Watson-Glaser Critical Thinking Appraisal was found to be a widely used instrument both for the purpose of evaluation and research. However, it appeared that no specific norms of this test were available for an exclusive Negro population. Therefore, it seemed justifiable to develop a set of norms for this test based entirely on a narrowly defined Negro college population.

Statement of the Problem

The problem of the study may be stated in the forms of specific questions as follows:

1. Are there any statistically significant mean differences on the Watson-Glaser Critical Thinking Appraisal, the Dogmatism Scale, and the Test of Independence of Judgment among Negro college students grouped by sex and academic status defined as being or not being in remedial programs?

2. What are the intercorrelations between scores on the subtests and the total test of the Watson-Glaser Critical Thinking Appraisal, grade point averages, the Dogmatism Scale, the Test of Independence of Judgment, and the Scholastic Aptitude Test?

3. Are there any statistically significant differences in correlations among subgroups as classified by sex and academic status?

4. What are the percentile ranks, reliabilities, and related data of the Watson-Glaser Critical Thinking Appraisal subtests and total test for freshmen, sophomores, males, females, and the combined groups?

Purpose of the Study

The purpose of the study was (1) to ascertain the adequacy of the WGCTA for use with Negro college students; (2) to establish Negro college norms and furnish normative data for the WGCTA; and (3) to ascertain factors which were presumed to be associated with performance of critical thinking.

Assumptions and Limitations

The assumptions and limitations of the study can be stated as follows:

1. The study was limited to Negro college students of the freshman and sophomore classes in a southern Negro state college. The findings of the present investigation may not be generalized to any other population which possess substantially different characteristics.

2. It was assumed that students who participated in this research were eager to cooperate and give accurate responses.

3. It was assumed that the instruments employed did measure what they were supposed to measure. Also, the findings of the study were dependent to a large extent on the validity and reliability of these instruments.

Organization of the Study

The report of the study was organized into five chapters in addition to sections containing reference and appendix sections. Chapter I includes a discussion of the need, the purpose, and the justification of the study. Chapter II is devoted to the review of related literature. The description of subjects, instruments, and methodology are narrated in Chapter III. Chapter IV presents and analyzes the data which are pertinent to the research problem. The summary of the investigation with conclusions and recommendations comprise the final chapter.

CHAPTER II

REVIEW OF RELATED LITERATURE

Although critical thinking is generally recognized as one of the most desirable educational objectives, search of the literature revealed that research in the above area has been relatively meager. Such a gap might be ascribed to the lack of clear and comprehensive conceptions of what thinking involves on one hand, and the dearth of adequate instruments to evaluate its products on the other. Nevertheless, progress was made in the direction of clarifying the terms and analyzing the relationship between affective factors and performance of critical thinking. The following section mainly reports research germane to these two categories.

Nature and Conceptions of Critical Thinking

As a global concept, critical thinking was sometimes considered connotatively to have similar meaning to "reflective thinking," "scientific thinking," and particularly "logical thinking." Edwards (19), for example, saw no clearly apparent differences in meaning between the word "critical" and such descriptive terms as "reflective," "elaborative,"

"scientific," and "straight." Hyram(37) regarded thinking as critical when it was essentially logical. Black (8) likewise conceived critical thinking and logical thinking as essentially the same. According to him, logic is the art and science of criticism of reasoning. A mastery of the rules and principles of logic is essential to cultivating systematic, persistent, and above all, critical thinking.

Dewey's (15) work on reflective thinking provided a basis for evaluating the product of thinking. For Dewey, reflective thinking meant judgment suspended during further inquiry. To reflect was to hunt for additional evidence in order to corroborate or refute the first suggestion that occurred. To accept at once the suggestion that occurred would result in uncritical thinking. Thus reflective thinking, as Dewey emphasized, involved overcoming the inertia that inclined one to accept suggestions at their face value, as well as willingness to endure a condition of mental unrest. (15)

"Inquiry" is another term which was found to be related to critical thinking. In Logic: The Theory of Inquiry, Dewey (16) defined inquiry as:

> . . . the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinction and relation as to convert the elements of the original situation into a unified whole.

Bruner (11) emphasized that inquiry involved both analytic thought processes and intuitive grasp of the structures of a discipline. Massialas and Zevin (47) defined

inquiry as a "behavior which is characterized by a careful exploration of alternatives in seeking a solution to a problem." It embodies not only such cognitive tasks as construction of hypothesis, definition of terms, and validation of proposition, but also creative ideas and conjectual thinking.

Evaluative thinking is another term which approximates the concept of critical thinking. Ruch (54) regarded evaluation as the kind of reasoning concerning judgment of the soundness or appropriateness of an idea or product. Critical thinking is evaluative in nature because it involves judging the suitability or goodness or effectiveness of an idea or representation. Guilford (30), in analyzing the nature of intelligence, identified evaluation as "a process of comparing a product of information with known information according to logical criteria, making a decision concerning criterion satisfaction." Similarly, Bloom (10) regarded evaluation as judging the value of materials and methods for given purposes by applying standards and criteria.

Critical thinking is closely related to evaluation in that it always involves some criteria and standards. Henderson (35) identified three R's in critical thinking, which he refered to as rating, rule, and reason. According to him, the critical thinker evaluates what he is thinking about by applying certain rules or criteria, which may be implicitly or explicitly stated. These guide his observations and thought. He rates the object of his thought, and justifies his rating

by reasons.

Russell (55) viewed critical thinking as the process of (1) examining both concrete and verbal materials in terms of related objective evidence, (2) comparing the object or statement with some norms or standards, and (3) concluding or acting upon the judgment then made. Russell also suggested that critical thinking depends upon the individual's background of information, his attitude of acceptance, or suspended judgment as well as his skills in applying standards.

Jelinek (38) viewed critical thinking as essentially a matter of interpreting facts, applying generalizations, and recognizing errors in logic. He refered to interpretation as evaluating ideas, making deduction, inferences, and generalizations and drawing conclusions on the basis of facts presented. Applying generalizations involves the ability to determine the conditions under which a concept will be satisfied and to recognize and devise reasons for the application of the principle. The skill of recognizing errors in logic includes the ability to detect propaganda; to recognize key words and distortion which would lead to false conclusions, and to avoid ridicule or appeals to prejudice in attempting to disprove logical statements.

Lack of clear conceptions of the specific behaviors that comprise the cognitive components of critical thinking led Eisner (20) to analyze this global concept into four

constituted parts. Eisner termed the first component of critical thought "questing," which is a conscious and deliberate pursuit of knowledge, exemplified by the student's independently initiated search for the problematic and his disposition towards wonder. The second component was that of "speculation," which was viewed as the ability to generate models or theories to explicate phenomena. "Evaluation" was considered by Eisner as the third component of critical thinking. The criteria of evaluation involves three major dimensions. First, an idea or body of ideas in any field is evaluated for the logic of its propositions. The second type of criterion is concerned with evidence. The third type of criterion that is applied in the evaluation of propositions is of a qualitative variety, which refers to the ways in which language is organized, the types of words that are selected, and the emphasis given to certain phrases. The fourth component of critical thinking is that of "constructing." Constructing is the production of relationships or parallels between seemingly unrelated concepts. By means of the process of constructing, the individual is able to perceive elements as part of a larger whole and their relationships and interaction with each other.

Perhaps the most comprehensive attempt to refine the concept of critical thinking was made by Ennis (22). Stemming from the root notion that critical thinking is construed as the

correct assessment of statements, Ennis identified twelve aspects of critical thinking. He listed the twelve aspects of critical thinking as:

1. Grasping the meaning of a statement.
2. Judging whether there is ambiguity in a line of reasoning.
3. Judging whether certain statements contradict each other.
4. Judging whether a conclusion follows necessarily.
5. Judging whether a statement is specific enough.
6. Judging whether a statement is actually the application of a certain principle.
7. Judging whether an observation statement is reliable.
8. Judging whether the inductive conclusion is warranted.
9. Judging whether the problem has been identified.
10. Judging whether something is an assumption.
11. Judging whether a definition is adequate.
12. Judging whether a statement made by an alleged authority is acceptable.

Ennis also proposed a three dimensional model of critical thinking which he referred to as logical, criterial, and pragmatic. The logical dimension involved judging alleged relationships between meanings of words and statements, while the criterial dimension included knowledge of the criteria for judging statements, with the exception of the logical criteria which were covered in the first dimension. The pragmatic dimension covered the impression of the background purpose on the judgment as well as the decision as to whether the statement is good enough for the purpose.

Critical Thinking and Related Factors

Research on critical thinking largely has been the study of the influence of emotional factors upon its performance.

The research by Frenkel-Brunswik (26), Adorno, et al. (1), Rokeach (53), and others have great implications for the study of the relationship between affective variables and critical thinking. These studies and other experimental evidence have repeatedly demonstrated that human cognitive processes are not free from the influence of the affective factors.

Among the early investigations of the relationship between emotional factors and the logicality of thoughts was Lefford's (44) study. The purpose of Lefford's study was to demonstrate the effect of verbal stereotypes on syllogistic reasoning and how attitudes and the factor of set might modify this behavior. The method consisted of presenting a questionnaire of 40 syllogistic problems to a group of college students. The syllogisms consituted two kinds of problems which were equated in terms of structure and length but differed in the content of the subject matter. Half of the syllogisms were of a socially controversial nature, which might arouse an emotional reaction, and the other half contained only materials of a neutral nature. The subjects were instructed first to judge the validity of the syllogisms and were then asked whether they would agree or disagree with the conclusions. The first response was taken as an indication of their ability to solve syllogistic problems; the second as an indication of their opinions, belief, or attitude toward the subject matter. It was found that most subjects solved neutrally toned syllogisms more correctly than emotionally toned syllogisms. It

was also found that solving emotionally toned syllogisms first had a deleterious effect on the results of the subsequent solution of neutral syllogisms, while solving neutrally toned syllogisms first had a salutary effect on the subsequent solution of the affectively toned syllogisms.

Thistlethwaite (63) conducted a similar study in which non-syllogistic forms of inference were employed. The test materials consisted of seventy two arguments, of which thirty six were presumably of relatively neutral content, and thirty six presumably of emotional content. A total of 559 subjects were sampled from seven northern, western, and southern universities. Analysis of the covariance of errors on both neutral and emotional items indicated that the hypothesis that attitudes and beliefs were a determinant of reasoning should be rejected. When the groups from two sections were compared, it was found that the errors of distortion in reasoning were significantly higher for the southern subjects than for the northern subjects both on the ethnocentrism scale and the anti-Negro subscale.

The extent to which a person's attitude on a subject might interfere with his ability to think logically on that subject was investigated by Gorden (29). For the purpose of the study, Gorden constructed a syllogistic reasoning test with five possible conclusions for each syllogism. Of the five conclusions, only one followed logically. Two conclusions were pro-Russian, and two were anti-Russian statements.

The results of the syllogistic test were then compared with the respondents' position on the ostensibly anonymous opinionnaire. It was found that the individual's attitude in a large minority of cases (11 out of 28) interfered with reasoning processes. Of the eleven individuals who showed a total of forty responses, every individual was either all pro-or all anti-Russian.

An attempt was made by McNemar (48) to differentiate, within a college sample, individuals high from those low in reasoning ability with respect to (1) free and controlled word-association: (2) deduction and induction: and (3) experimentally induced set. A reasoning test, consisting of four subtests, was used as the criterion-measure. The upper 15 per cent and the lower 15 per cent of each sex distribution were selected to make up the high and low groups. The following were the conclusions of the study:

1. High and low groups did not differ in speed of unrestricted word flow, but did differ in speed of controlled association in favor of the high group.

2. Good reasoners were more accurate in both deductive and inductive processes and were faster in solving induction problems.

3. Good and poor reasoners differed significantly in the ability to solve problems in the volume-measuring series and overcome set. However, there was no significant difference in susceptibility to set.

The previous studies were concerned primarily with the influence of emotional factors upon logical thinking. Shelley and Davis (57) investigated to a further extent whether socially significant attitudes were related to errors in solving logical problems and whether these errors could be reduced or eliminated through instruction in logic. Two groups of college students served as subjects in the study, including twenty four who were not enrolled in a course in logic and thirty three who were enrolled in a symbolic logic class. A shortened form of the Thistlewaite test and a 20-item version of the California F Scale were administered in the order mentioned. The distribution of the scores on the F Scale was divided at the median for each of the groups. Analysis of the data indicated that the High F Scale subjects in both groups made significantly more errors on the attitudinal items. It was also found that even though the number of errors were reduced as a result of training in logic, attitudes still significantly influenced scores. The authors, however, did not justify any conclusion without further investigation that low F Scale subjects responded more according to logic than attitude.

Morgan (49) compared differences in logical reasoning among male applicants for government employment with respect to age and education. It was found that those who were in the twenty to twenty nine year-old group had higher scores in logical reasoning than the thirty to thirty-nine year-old

college graduates. The difference was statistically significant for those with bachelor's degrees but not for those with master's degrees.

Burton and Joel (14) reported the adult norms for the Watson-Glaser Tests of Critical Thinking. A total of 150 applicants for civil service positions were tested. It was found that the norms for adults were higher then the Watson-Glaser norms for college seniors. The report also indicated that the subjects below the median age of 36.9 made higher mean scores on all four tests than those above the median age. All the differences were statistically significant. Comparison of subjects with two or more degrees with those who had no or one degree revealed no significant differences. However, the direction was in favor of those with two or more degrees.

A comparative study of certain value-patterns and critical thinking skills of graduate students was conducted by Bledsoe (9). The subjects consisted of twenty-two males and twenty-four females who were enrolled in a graduate course entitled "Methods of Applied Research in Education" at the University of Georgia. The Allport-Vernon-Lindzey Study of Values and the Watson-Glaser Critical Thinking Appraisal were administered both before and after the intensive course in research methodology. Bledsole reported that while there were no significant differences in pre-course and end-course mean scores in values, a significant difference in mean

scores on the Critical Thinking Appraisal from pre-course to end-course was obtained. Comparison of mean difference in values and critical thinking for both sexes were found to be insignificant except for the Aesthetic Scale, on which women made a higher mean score.

Assuming that thinking is critical when essentially logical, Hyram (37) sought to test the hypothesis that an individual's growth in the ability to do logical thinking must depend upon his acquiring a working knowledge of the basic rules of logic. For experimental purposes, two groups of upper-grade children were equated in terms of (1) general intelligence, (2) mental age, (3) general reasoning ability, (4) general language proficiency, and (5) initial reasoning ability. The children in the experimental group received instructional procedure which comprised both content material and teaching methods for 250 minutes per week. The content material was acquired through an analysis of the understandings deemed basic to an adequate concept of logical thinking. The method employed was essentially the Socratic method and consisted of carefully phrased questions based on simple problems. The instruction given to the control group consisted of the regular classroom activities and standard subject matter content. A final test in reasoning was given to both groups and the difference in mean achievement was tested for significance. It was found that difference in achievement on the same test at the end of the experiment between the two

groups were highly significant in favor of the experimental group.

Lehmann (43) used a longitudinal approach to investigate the changes occurring in college students' critical thinking ability, attitudes and values from freshman to senior years. The Test of Critical Thinking along with other instruments was administered during orientation week to all native born American freshmen (1,436 males and 1,310 females) entering Michigan State University in the fall of 1958. Near the end of the senior year the same instruments were again administered to these remaining students. It was reported that at the end of four years of college, both males and females increased their critical thinking scores significantly. Students became more proficient in such tasks as the selection of pertinent information and the ability to formulate and select relevant hypotheses. It was also found that both males and females became more flexible, less rigid, and less authoritarian during their four years at college.

Kempt (39) compared those who were low with those who were high in dogmatism with respect to their ability in critical thinking. The sample was comprised of a total of 500 students from four colleges. The students were administered the Dogmatism Scale Form E, and the critical thinking problems. The 150 students with the highest scores and 150 with the lowest scores in dogmatism were selected for the comparison of results in critical thinking. Kempt found that the low group

was superior in critical thinking to the high group. He concluded that the less efficient performance of the highly dogmatic group was a result of their difficulty in tolerating ambiguities and their tendency toward an early "closure" before a full consideration of all factors involved. Moreover, the highly dogmatic students suffered from perceptual distortion of facts that resulted in decisions which did not encompass all elements of the problem. It was also pointed out by Kempt that the highly dogmatic students had a tendency to reject or ignore the significant parts of the whole problem in order to fit into the performed value pattern.

The results of the above study led Kempt to the assumption that improvement in critical thinking might also be influenced by the factor of dogmatism. In another study Kempt (40) thus hypothesized that students low in dogmatism would show greater improvement in critical thinking than those who were high. For the purpose of the study, two groups of freshman students were equated in intelligence and in degree of open-and closemindedness. Both the experimental group and the control group were taught by the same instructor. The experimental group was divided into five subgroups, each of which consisted of four students who were high and four students who were low in dogmatism. All subgroups participated in ten one-hour meetings which were used in solving and discussing critical thinking problems. The control group, however, was not given any special help in this regard. At the end of the study, it

was found that the experimental group did significantly better in critical thinking than the control group. As far as improvement in critical thinking was concerned, the "low" dogmatic students of the experimental group performed significantly better at the 1 per cent level. The other groups, however, did not improve significantly.

CHAPTER III

DESIGN AND PROCEDURE OF THE STUDY

This chapter discusses the procedure and methodology of the study. Space is given to the description of sampling procedure, the background characteristics of the subjects, and the instruments employed. The statistical treatment of data is also reported.

Sampling Procedure

The study was conducted at a predominantely Negro college located in a southern state. The college is a state supported, and teacher-education oriented institution. The sex ratio of the student body is about two to one in favor of the females. During the Spring Quarter of 1968, a total of 1,506 students were enrolled, of which 698 were freshmen and 330 were sophomores. Only freshman and sophomore students were included in this study. In order to keep the test administration under manageable control, samples of 420 freshman and 220 sophomore students, which represented 60 per cent of the original population, were drawn randomly using a random digit table (27).

A letter signed by the Dean of Instruction was sent to each student requesting his cooperation in participating in the research project. The students were advised that the research was in the interest of improving the educational program and that their sincere cooperation was extremely important. The administration of the instruments was scheduled in three different settings. Follow-up letters were sent to those students who did not take the test as scheduled for the second and third time. A total of 355 freshmen and 151 sophomores completed all the instruments. This gave a grand total of 506, which corresponded to about 82 per cent of the combined original sample.

Description of the Subjects

Since the characteristics of the subjects determine to a large extent the results of the research, a detailed description of the subjects under study was considered necessary. At the time of testing, each subject was requested to fill out a separate questionnaire in order to secure background data with respect to family income, parental education, and father's occupation. The obtained data are reported in the following sections.

Total family income. On the average, subjects came from families of relatively deprived economic conditions, compared to an average college population. From the information furnished by the subjects regarding their total family incomes,

it was found that 21 per cent earned less than $2,400 per year; 20 per cent earned between $2,400 to $3,599; 30 per cent fell in the range of $3,600 to $5,999; and 29 per cent reported an income of $6,000 or more.

Parental education. A majority of the students in the sample, as illustrated from Table 1, came from families with parents having only high school education or below. Of particular interest was the fact that the mothers tended to have received more education than the fathers. Twenty one per cent of the fathers terminated their education with grade school or less as compared to only 6 per cent of the mothers. On the other hand, twice as many of the mothers had received college degrees as had the fathers. The similar characteristics were also reported by Gurin and Katz (32).

TABLE 1

NUMBERS AND PERCENTAGES OF PARENTAL EDUCATION OF NEGRO COLLEGE STUDENTS

Amount of Education	Father		Mother	
	N	%	N	%
Grade school or less	98	21	32	6
Some high school	218	47	255	51
High school graduation	85	19	99	20
Some college	37	8	57	12
College degree or more	24	5	54	11

Father's occupation. The occupational level of the fathers was in line with their attained educational level.

It was reported by the students that 81 per cent of the employed fathers had working-class occupations as compared to 19 per cent having middle-class or higher occupations.

From this background data, it appeared that, on the whole, this was a group that came from families of rather low socio-economic status. In fact, about 40 per cent of these students were from families whose annual incomes were below $3,600 , an economic condition that may be described as poverty (32). The relatively low educational attainment of the parents might partially account for the low occupational status and hence, the deprived economic conditions.

Description of the Instruments

Collection of data was based on two sources: the scores on the instruments and the student's academic record. The scores on the Scholastic Aptitude Test and each student's cumulative grade point average were obtained from the records office. The other instruments were administered on one single occasion. Descriptions of the major instruments are given below.

The Watson-Glaser Critical Thinking Appraisal. The WGCTA is designed to provide a series of exercises which require the application of some of the important abilities involved in critical thinking. The problems and situations provided in the test are similar to those which a citizen in a democratic society might encounter in his daily life.

The test is available in two forms, Ym and Zm. Each form consists of five subtests which are designed to measure different but interdependent aspects of critical thinking. The WGCTA is a power test which requires no rigid time limit. Most persons, however, can complete the whole test in about fifty minutes. Watson and Glaser (64) described the five subtests as follows:

> Test 1. Inference. (Twenty items.) Samples ability to discriminate among degree of truth or falsity of inferences drawn from given data.
>
> Test 2. Recognition of Assumptions. (Sixteen items.) Samples ability to recognize unstated assumptions or presuppositions which are taken for granted in given statements or assertions.
>
> Test 3. Deduction. (Twenty-five items.) Samples ability to reason deductively from given statements or premises; to recognize the relation of implication between propositions; to determine whether what may seem to be an implication or a necessary inference from given premises in indeed such.
>
> Test 4. Interpretation. (Twenty-four items.) Samples ability to weigh evidence and to distinguish between (a) generalizations from given data that are not warranted beyond a reasonable doubt, and (b) generalizations which, although not absolutely certain or necessary, do seem to be warranted beyond a reasonable doubt.
>
> Test 5. Evaluation of Arguments. (Fifteen items.) Samples ability to distinguish between arguments which are strong and relevant and those which are weak or irrelevant to a particular question at issue.

The odd-even split-half reliability coefficients for the total test of Form Zm ranged from .77 to .83 as reported in the test manual. The subtest split-half reliability coefficients for the Grade 10 normative groups are: Inference,

.55; Interpretation, .52; and Evaluation of Arguments, .40.

The intercorrelations between each of the subtests of Form Zm, and the total test as reported in the test manual ranged from .56 to .76. The authors were not inclined to believe that the validity of a test could be generalized by a single correlation coefficient. They suggested that the aspect of validity should be considered in accordance with the situation in which the test is used (64).

The Dogmatism Scale. Developed by Rokeach (53), the scale was designed to measure individual differences in openness or closedness of belief systems. The Scale may also be used for measuring general authoritarianism and general intolerance.

Form E of the Scale contained forty statements, which were answered by the degree of agreement or disagreement. For all statements, agreement was scored as closed, and disagreement as open. The highest possible score was 280 and the lowest possible score was forty. The total score on the Scale was the sum of scores obtained on all items.

The Scale was reported to have reliabilities ranging from .68 to .93, which were claimed by the author to be quite satisfactory. The Scale was validated through a series of investigations. In one study, Rokeach (53) used the known method of validation. The graduate psychology students were asked to select friends who were considered to be open- and

closed-minded. The Scale was then administered to these persons. It was found the Scale unambiguously differentiated the high and low dogmatic groups in the predicted direction.

Test of Independence of Judgment. This scale was developed by Barron (4) through an item analysis of 86 items. These items were carefully selected or written anew from an original pool of 200 items in an effort to test the particular hypotheses concerning personality differences between Independents and Yielders as identified in conformity experiments. The highest 27 per cent and the lowest 27 per cent of scorers on the Complexity Scale served as the criterion group because it was found that the Independents and Yielders were clearly different in their preference for complexity and simplicity. The questionnaire responses of the high group then were compared with the low group. Items which showed differences significant at the .05 level were included in the final 22-item scale.

The pattern of responses to the Independence questionnaire items, as summarized by Barron, indicates that the preference for complexity is related to artistic interest, unconventionality, political radicalism, creativity, and a desire for change. Preference for simplicity, on the other hand, is associated with a disliking for modern art, friendliness toward tradition, categorical moral judgment, preference of symmetry to asymmetry, undeviating patriotism, and suppression of new

inventions which would temporarily cause unemployment. The reliability of this scale is not known.

Scholastic Aptitude Test. The College Entrance Examination Board Scholastic Aptitude Test (SAT) is a well-known instrument used by a large number of colleges and universities as a criterion of admission. The test is designed to measure general verbal and mathematical comprehension.

Form KSA_{45} consists of five separately timed sections. Two scores are reported. The verbal score is based on antonyms, sentence completion, analogies, and reading comprehension items; the mathematical score is based on word problems and data sufficiency items.

Test-retest reliability coefficients are .89 for the verbal scale and .85 for the mathematical scale for time intervals up to ten months (13). Kuder-Richardson reliability coefficients for all forms range from .88 to .91 for the verbal test and .87 to .91 for the mathematics test. The reliabilities of Form KSA_{45} are .92 for verbal and .93 for mathematics scores (13).

Some selected validity coefficients were reported to be modest for predicting scores of male liberal arts students as measured by freshman average grades. They ranged from .16 to .61 with a median of .35 for verbal scores, and from .15 to .53 with a median of .33 for mathematics scores. For female students, the range was found to be the same with median values of .36 and .26 for verbal and mathematics scores,

respectively (13).

Statistical Treatment of Data

The methods used in analyzing the data were determined by the nature of the research problem. The following statistical techniques were employed in solving the problem.

1. Tests of significance involving differences in means, standard error of the differences, and the critical ratio of significance were used in determining whether there were any significant differences in mean scores between different subgroups in test variables.

2. Pearson product-moment correlation coefficients were employed in determining the relationships between variables. Significance of the difference between two r's were computed in order to determine whether the differences in correlation coefficients between each subgroup were statistically significant.

3. Norm tables were established by computing percentile ranks of the raw scores obtained from the WGCTA. Means, standard deviation, split-half reliability coefficients corrected by Spearman-Brown formula, and the standard error of measurement were also computed.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

This chapter is divided into four major sections. The first two sections report the differences in mean values of scores on the WGCTA, the Dogmatism Scale, and the Test of Independence of Judgment. Correlational analysis of the WGCTA and selected variables are presented in section three. Section four describes the development of norms for the WGCTA along with other relevant normative data.

Comparisons of Mean Values on the WGCTA Test

The first step in analyzing the data was to determine whether the two samples drawn separately came from two different populations with respect to performance on critical thinking. Table 2 presents the mean scores, standard deviations, and differences in means for the freshman and sophomore samples. As shown in the table, there were no significant mean differences between these two samples on either the total scores or any of the subtest scores. However, the direction was in favor of the sophomores in all measures except in the Assumption subtest where both means were equal.

Since there were no significant mean differences between freshmen and sophomores, the original data were, therefore, pooled together for other comparisons. It was presumed from the outset that both sex and academic status were important variables relative to the performance of critical thinking. Academic status was defined as being or not being in the remedial programs. More than 70 per cent of the students sampled were required to take either one or both remedial courses in English or mathematics because of their deficiency in these two areas as judged by their previous records and relatively low scores received on some

TABLE 2

MEAN SCORES, STANDARD DEVIATIONS, AND DIFFERENCES IN MEANS OF SCORES ON THE WGCTA FOR FRESHMAN AND SOPHOMORE SAMPLES WITH SEX COMBINED

WGCTA	Freshman		Sophomore		Diff.	C.R.
	M_1	$S.D._1$	M_2	$S.D._2$	M_1-M_2	
Inference	6.1	2.6	6.3	2.7	-0.2	0.77
Assumptions	9.1	2.3	9.1	2.5	0.0	0.00
Deduction	13.3	2.9	13.8	2.9	-0.5	1.79
Interpretation	12.4	2.8	12.7	2.8	-0.3	1.11
Arguments	8.6	2.3	8.8	2.1	-0.2	0.95
Total Scores	49.6	7.8	50.9	8.1	-1.3	1.67

standardized tests. Those students who were required to take only one remedial course were eliminated in any further comparisons in view of their being in the middle-of-the-road

position as well as the either-or situation.

Comparisons of males with females in mean scores on the WGCTA with academic status being held constant yielded the results presented in Table 3. As shown in the table, the nonremedial males scores significantly higher than the nonremedial females in Deduction, Interpretation, and the total test. The nonremedial males had a mean total score of 57.9 as compared to 53.4 for the nonremedial females. The difference was significant beyond the one per cent level. For the two remedial groups, the males had significantly higher mean scores in Assumption and total critical thinking. However, the difference in total mean scores was barely significant at the 5 per cent level with respective values of 49.2 and 47.4 for the remedial males and remedial females. On the whole, it may be safely concluded that there are sex differences in favor of male students with respect to critical thinking abilities.

Differences in mean critical thinking scores between remedial and nonremedial students with sex being held constant are reported in Table 4. When the non-remedial groups were compared with the remedial groups, the differences in means were found to be highly significant in total critical thinking scores as well as in most of the subtests for both males and females. However, in the case of males, the difference between the remedial and nonremedial groups was not found to be statistically significant. The difference between the two female

TABLE 3

MEAN SCORES, STANDARD DEVIATIONS, AND DIFFERENCES IN MEANS OF SCORES ON THE HGCTA FOR MALE AND FEMALE STUDENTS[a]

Variable	Male		Female		Diff.	C.R.
	M_1	S.D.$_1$	M_2	S.D.$_2$	M_1-M_2	
Infer.						
Remedial	5.6	2.0	5.5	2.3	0.1	0.33
Nonremedial	8.3	2.6	7.4	2.9	0.9	1.73
Assum.						
Remedial	9.4	2.3	8.4	2.0	1.0	3.23**
Nonremedial	9.9	2.9	9.7	2.6	0.2	0.42
Deduc.						
Remedial	13.4	2.6	13.3	2.8	0.1	0.27
Nonremedial	15.1	3.0	13.4	3.0	1.7	2.93**
Inter.						
Remedial	12.3	2.7	11.7	2.4	0.6	1.62
Nonremedial	14.7	3.2	13.4	2.4	1.3	2.32**
Argum.						
Remedial	8.2	2.4	8.4	2.3	-0.2	0.60
Nonremedial	9.6	2.4	9.1	2.0	0.5	1.11
Total						
Remedial	49.2	6.6	47.4	6.6	1.8	1.96*
Nonremedial	57.9	9.0	53.4	7.9	4.5	3.13**

[a]Male: Remedial N=73; Nonremedial N=45
Female: Remedial N=188; Nonremedial N=68
*Significant at the 5% level.
**Significant at the 1% level.

groups in deduction also failed to reach any level of significance. As indicated in Table 4, it may be concluded that students who were not required to take any remedial courses were also superior in critical thinking skills than those who were in the remedial programs.

TABLE 4

COMPARISONS OF DIFFERENCES IN MEANS ON THE WGCTA BETWEEN REMEDIAL AND NONREMEDIAL STUDENTS

Variable		Non-Remedial M_1	Remedial M_2	Diff.	C.R.
Inference	M	8.3	5.6	2.7	5.87**
	F	7.4	5.5	1.9	5.00**
Assumption	M	9.9	9.4	0.5	0.96
	F	9.7	8.4	1.3	5.42**
Deduction	M	15.1	13.4	1.7	3.09**
	F	13.4	13.3	0.1	0.24
Interpretation	M	14.7	12.3	2.4	4.14**
	F	13.4	11.7	1.7	5.00**
Argument	M	9.6	8.2	1.4	2.98**
	F	9.1	8.4	0.7	2.41*
Total Scores	M	57.9	49.2	8.7	6.59**
	F	53.4	47.4	6.0	5.60**

*Significant at the 5% level.
**Significant at the 1% level.

Comparisons of Mean Values on the Dogmatism Scale and the Test of Independence of Judgment

Comparisons of mean differences on the Dogmatism Scale and the Test of Independence of Judgment are presented in Tables 5 through 8. Table 5 reports the differences in means between the nonremedial males and nonremedial females. It can be seen from the table that the females had a higher mean score in dogmatism than the males. The respective values for the males and females were 162.3 and 176.5. The difference

was significant at the 1 per cent level. This suggested that the females were more dogmatic or closedminded in outlook than the males. On the other hand, the males appeared to have higher mean score on independence of judgment. However, the difference was not statistically significant.

TABLE 5

COMPARISONS OF MEAN DIFFERENCES IN DOGMATISM AND INDEPENDENCE OF JUDGMENT BETWEEN NONREMEDIAL MALES AND NONREMEDIAL FEMALES

Variable	Male		Female		Diff.	C.R.
	M_1	$S.D._1$	M_2	$S.D._2$		
Dogmatism	162.3	26.8	176.5	21.6	-14.2	2.94**
Ind. Judgment	18.9	5.4	17.3	4.8	1.6	1.60

**Significant at the 1% level.

Comparisons of the differences in means between the two remedial groups are presented in Table 6. It would appear that there were no sex differences in these two variables for those who were in the remedial programs. The obtained critical ratios of .38 and 1.29 were so small that the differences could be attributed to chance errors.

Table 7 presents the differences in mean between the nonremedial males and the remedial males. The mean scores of 162.3 for the nonremedial group and 182.3 for the remedial group were significantly different beyond the 1 per cent level

TABLE 6

COMPARISONS OF MEAN DIFFERENCES IN DOGMATISM AND INDEPENDENCE OF JUDGMENT BETWEEN REMEDIAL MALES AND REMEDIAL FEMALES

Variable	Male		Female		Diff.	C.R.
	M_1	$S.D._1$	M_2	$S.D._2$		
Dogmatism	182.3	23.6	183.5	20.8	-1.20	.38
Ind. Judgment	17.0	4.5	16.2	4.5	0.80	1.29

in the case of dogmatism. This indicates that the nonremedial males were more open than the remedial males in their belief system. Comparison of the mean scores on independence of judgment rendered a difference of 1.9 score points, which was significant at the 5 per cent level in favor of the nonremedial group. The nonremedial males obtained a mean score of 18.9 as compared to 17.0 for the remedial males.

TABLE 7

COMPARISONS OF MEAN DIFFERENCES IN DOGMATISM AND INDEPENDENCE OF JUDGMENT BETWEEN NONREMEDIAL MALES AND REMEDIAL MALES

Variable	Nonremedial		Remedial		Diff.	C.R.
	M_1	$S.D._1$	M_2	$S.D._2$		
Dogmatism	162.3	26.8	182.3	23.6	-20.0	4.08**
Ind. Judgment	18.9	5.4	17.0	4.5	1.9	1.96*

*Significant at the 5% level.
**Significant at the 1% level.

Table 8 presents the mean difference between the two female groups. As in the case of the males, the nonremedial females also had a smaller mean score (176.5) than the remedial females (182.3) in dogmatism. The difference was significant at the 1 per cent level. The mean difference between the two groups in independence of judgment, however, was not statistically significant.

From the above comparisons, it may be concluded that the nonremedial students, whatever their sex, tended to be less dogmatic and more independent in their judgment than their counterparts. In general, males appeared to be more open in their belief system than females. However, this was true only for those who were not in the remedial programs. For those who were required to take remedial courses, it appeared that the males were as dogmatic as the females.

TABLE 8

COMPARISON OF MEAN DIFFERENCES IN DOGMATISM AND INDEPENDENCE OF JUDGMENT BETWEEN THE NONREMEDIAL FEMALES AND REMEDIAL FEMALES

Variable	Nonremedial		Remedial		Diff.	C.R.
	M_1	$S.D._1$	M_2	$S.D._2$		
Dogmatism	176.5	21.6	183.5	20.8	-7.0	3.00**
Ind. Judgment	17.3	4.8	16.2	4.5	1.1	1.63

**Significant at the 1% level.

Correlational Analysis of the Subtest and Total Scores on the WGCTA and Selected Variables

The Pearson product-moment coefficient of correlation was employed as the statistical technique to determine the relationship among critical thinking scores and other selected variables. It has generally been recognized that the coefficient of correlation is very much dependent on the range of talents within the group. In order to obtain a valid measure of relationships, Woodworth (67) insisted that the coefficient must be freed of the extraneous influences which affect the relationship between the variables concerned. Guilford(31) likewise suggested that it would be best to compute correlations within subsamples separately if it was doubtful whether subsamples arose by random sampling from the same population. For this reason, the correlation coefficients were computed separately for the four groups which were isolated by sex and academic status. It has already been shown in the previous sections that these groups differed one way or another in critical thinking as well as in belief systems.

Tables 9 through 12 present the intercorrelations among critical thinking scores, grade point averages, scores on the Scholastic Aptitude Test, dogmatism, and independence of judgment for each of the four groups. The differences between correlations were determined by using Z transformations as suggested by Guilford (31). The required levels

of significance are the same as those applied to the differences between means.

Table 13 reports the Z transformations of the differences in correlations between the nonremedial males and nonremedial females. It can be seen from the table that the correlations which differed significantly include Assumption-SAT(V), Assumption-SAT(M), Assumption-Deduction, and Interpretation-total critical thinking scores with respective values of -.25, -.23, -.07, and .74 for the males and .23, .16, .34, and .48 for the females. The correlation between grade point average and SAT(M) failed to reach the required level of significance with values of .60 for the females and .30 for the males.

Comparisons of the differences in correlations between the remedial males and remedial females are presented in Table 14. Significant differences were found in the relationship between GPA and SAT(V) with coefficients of -.16 and .23 for males and females respectively. The correlation coefficient of -.08 obtained for the remedial males also differed significantly from the value of .29 obtained for the remedial females in the correlations between GPA and Inference. In both cases, the differences were significant beyond the 1 per cent level.

Table 15 presents the Z values of the differences between the correlations obtained for the nonremedial males and the remedial males. Differences significant beyond the 1 per cent level were the correlations of GPA-SAT(V), and

.67 for the nonremedial males and -.16 and .20 for the remedial males. Other significant differences in correlations between these two groups included SAT(V)-Assumption, Inference-Assumption, and Interpretation-Argument. For the nonremedial males, the respective coefficients were -.25, .39, and .47; for the remedial males, they were .14, .02, and .09.

Table 16 presents the Z values of the differences in correlations between the nonremedial females and the remedial females. The correlated variables which were found significantly different in four comparisons included GPA-SAT(M), SAT(V)-SAT(M), Dogmatism-Independence of Judgment, and Assumption-Deduction. The correlation between grade point average and SAT(M) was moderately high for the nonremedial females with a coefficient of .60 as compared to only .10 for the remedial females. The correlations between the two subtests of SAT were also significantly different with values of .56 for the nonremedial females and .24 for the remedial females. The nonremedial females had coefficients of -.23 and .34 in the correlations between dogmatism and independence of judgment, as well as Assumption and Deduction. In contrast, the remedial females received values of .07 and .05 in the two correlations respectively.

TABLE 9

INTERCORRELATIONS OF CRITICAL THINKING SCORES AND SELECTED VARIABLES FOR NONREMEDIAL MALES (N=45)

Variable	2	3	4	5	6	7	8	9	10	11
1. GPA	.42	.30	-.03	.05	.29	-.02	.13	.22	.23	.26
2. SAT-V		.67	-.05	.04	.17	-.25	.28	.36	.15	.23
3. SAT-M			-.08	-.16	.20	-.23	.36	.26	.24	.26
4. Dogmatism				-.23	-.17	-.14	-.17	.04	-.02	-.14
5. Ind. Judg.					.09	.02	-.04	.05	-.08	.01
6. Inference						.39	.15	.42	.42	.74
7. Assumption							-.07	.00	.09	.44
8. Deduction								.38	.20	.55
9. Interpretation									.47	.74
10. Argument										.67
11. Total WGCTA										

TABLE 10

INTERCORRELATIONS OF CRITICAL THINKING SCORES AND SELECTED VARIABLES FOR NONREMEDIAL FEMALES (N=68)

Variable	2	3	4	5	6	7	8	9	10	11
1. GPA	.44	.60	-.00	.15	.15	.11	.16	-.02	.01	.15
2. SAT-V		.56	-.10	.04	.27	.23	.14	.18	.11	.33
3. SAT-M			.02	.00	.22	.16	.05	.07	.05	.18
4. Dogmatism				-.23	-.02	-.11	-.07	-.05	-.17	-.16
5. Ind. Judgment					.01	-.02	-.07	-.01	.02	-.03
6. Inference						.11	.25	.26	.28	.66
7. Assumption							.34	-.03	.13	.54
8. Deduction								.16	.24	.70
9. Interpretation									.20	.48
10. Argument										.56
11. Total WGCTA										

TABLE 11

INTERCORRELATIONS OF CRITICAL THINKING SCORES AND SELECTED VARIABLES FOR REMEDIAL MALES (N=73)

Variables	2	3	4	5	6	7	8	9	10	11
1. GPA	-.16	.15	-.04	-.06	-.08	-.10	-.02	-.08	.14	.01
2. SAT-V		.20	-.23	-.07	.13	.14	.04	.12	.12	.20
3. SAT-M			-.06	-.08	.14	.00	.08	.06	.05	.12
4. Dogmatism				.01	-.23	.16	.02	-.16	-.12	-.11
5. Ind. Judgment					-.07	.05	.06	.08	-.14	.00
6. Inference						.02	.26	.10	.23	.54
7. Assumption							.12	-.05	.15	.43
8. Deduction								.21	.08	.63
9. Interpretation									.09	.54
10. Argument										.56
11. Total WGCTA										

TABLE 12

INTERCORRELATIONS OF CRITICAL THINKING SCORES AND SELECTED VARIABLES FOR REMEDIAL FEMALES (N=188)

Variable	2	3	4	5	6	7	8	9	10	11
1. GAP	.23	.10	.00	.03	.29	.10	.07	.09	.06	.22
2. SAT-V		.24	-.05	-.02	.22	.01	.24	.22	.14	.32
3. SAT-M			-.01	-.07	.21	.06	.06	.06	-.09	.11
4. Dogmatism				.07	-.13	-.06	-.16	-.01	.00	-.14
5. Ind. Judgment					.03	.09	-.03	.00	.09	.06
6. Inference						.07	.16	.23	.10	.56
7. Assumption							.05	-.01	.07	.38
8. Deduction								.21	.05	.61
9. Interpretation									.26	.63
10. Argument										.53
11. Total WGCTA										

TABLE 12

INTERCORRELATIONS OF CRITICAL THINKING SCORES AND SELECTED VARIABLES FOR REMEDIAL FEMALES (N=188)

Variable	2	3	4	5	6	7	8	9	10	11
1. GAP	.23	.10	.00	.03	.29	.10	.07	.09	.06	.22
2. SAT-V		.24	-.05	-.02	.22	.01	.24	.22	.14	.32
3. SAT-M			-.01	-.07	.21	.06	.06	.06	-.09	.11
4. Dogmatism				.07	-.13	-.06	-.16	-.01	.00	-.14
5. Ind. Judgment					.03	.09	-.03	.00	.09	.06
6. Inference						.07	.16	.23	.10	.56
7. Assumption							.05	-.01	.07	.38
8. Deduction								.21	.05	.61
9. Interpretation									.26	.63
10. Argument										.53
11. Total WGCTA										

TABLE 13

Z TRANSFORMATION OF THE DIFFERENCES IN CORRELATIONS BETWEEN NONREMEDIAL MALES AND NONREMEDIAL FEMALES

Variable	2	3	4	5	6	7	8	9	10	11
1. GPA	.15	1.92	.15	.50	.76	.66	.15	1.21	1.11	.61
2. SAT-V		.91	.25	.00	.56	2.47*	.30	1.01	.20	.56
3. SAT-M			.50	.81	.10	1.97*	1.67	1.01	.96	.45
4. Dogmatism				.00	.76	.15	.50	.96	.76	.10
5. Ind. Judgment					.40	.20	.15	.30	.50	.20
6. Inference						1.52	.56	.91	.86	.81
7. Assumption							2.21*	.15	.20	.66
8. Deduction								1.21	.20	1.26
9. Interpretation									1.57	2.17*
10. Argument										.91
11. Total WGCTA										

*Significant at the 5% level.

TABLE 14

Z TRANSFORMATION OF THE DIFFERENCES IN CORRELATIONS BETWEEN REMEDIAL MALES AND REMEDIAL FEMALES

Variable	2	3	4	5	6	7	8	9	10	11
1. GPA	2.78**	.36	.29	.64	2.71**	1.43	.64	1.21	.57	1.50
2. SAT-V		.29	1.29	.36	.64	.93	1.43	.70	.14	.93
3. SAT-M			.36	.07	.50	.43	.14	.00	1.00	.07
4. Dogmatism				.43	.70	1.57	1.29	1.07	.86	.21
5. Ind. Judgment					.70	.29	.64	.57	1.64	.43
6. Inference						.36	.79	.93	.93	.21
7. Assumption							.50	.29	.57	.43
8. Deduction								.00	.21	.14
9. Interpretation									1.29	1.00
10. Argument										.21
11. Total WGCTA										

** Significant at the 1% level.

TABLE 15

Z TRANSFORMATION OF THE DIFFERENCES IN CORRELATIONS BETWEEN NONREMEDIAL MALES AND REMEDIAL MALES

Variable	2	3	4	5	6	7	8	9	10	11
1. GPA	3.10**	.81	.05	.56	1.93	.40	.56	1.52	.46	1.27
2. SAT-V		3.10**	.91	.56	.20	2.03*	1.27	1.32	.15	.15
3. SAT-M			.10	.40	.30	1.16	1.52	1.07	.96	.71
4. Dogmatism				1.22	.30	1.52	.96	1.02	.15	.15
5. Ind. Judgment					.81	.15	.51	.15	.30	.05
6. Inference						1.98*	.61	1.78	1.12	1.78
7. Assumption							.96	.25	.30	.05
8. Deduction								.96	.61	.61
9. Interpretation									2.13*	1.78
10. Argument										.91
11. Total WGCTA										

* Significant at the 5% level.
** Significant at the 1% level.

TABLE 16

Z TRANSFORMATION OF THE DIFFERENCES IN CORRELATIONS BETWEEN NONREMEDIAL FEMALES AND REMEDIAL FEMALES

Variable	2	3	4	5	6	7	8	9	10	11
1. GPA	1.67	4.10**	.00	.83	1.04	.07	.63	.76	.35	.49
2. SAT-V		2.71**	.35	.42	.56	1.53	.69	.28	.21	.07
3. SAT-M			.21	.49	.07	.69	.07	.07	.90	.49
4. Dogmatism				2.08*	.76	.35	.63	.90	1.18	.14
5. Ind. Judgment					.14	.76	.28	.07	.49	.63
6. Inference						.28	.69	.28	.63	1.11
7. Assumption							2.08*	.14	.42	1.39
8. Deduction								.35	1.32	1.11
9. Interpretation									.49	1.53
10. Argument										.28
11. Total WGCTA										

*Significant at the 5% level.
**Significant at the 1% level.

Norms of the WGCTA and Other Normative Data

One of the major purposes of the present investigation was to establish a set of norms for the WGTA based on samples from a Negro college. It has been generally recognized that norms are restricted to the characteristics of the particular population from which they were derived. Therefore, in no sense can norms be considered as absolute and universal. To compare test scores derived from two different populations without making reference to their respective characteristics may be of little value and even misleading. Womer expressed this concern when he clearly pointed out that:

> . . . an atypical pupil or an atypical group of pupils (atypical in terms of educational opportunities) may not be judged "fairly" by a test which assumes equal educational backgrounds. Some may have had very rich opportunities to learn, other very meager ones. The differences among their scores--or some part of the differences--may, then, be chargeable to differences in opportunity rather than in ability.(66).

As a group, the subjects in this study came from families which were deprived economically, socially, as well as educationally. It was expected that these background characteristics might be partially reflected in scores they made on the test.

The norms for the WGCTA subtests and total test were presented in percentile rank form. The percentage of cases in a distribution that lay below any given score was called the

percentile rank of that score. The method of computing percentile rank, as proposed by Wert, Neidt, and Ashmann (65), was to divide the appropriate entry in the cumulative frequency column by the total number of cases and then multiply by 100. The result is always rounded upward to the nearest whole number.

Tables 17 through 22 are percentile ranks of scores on the Critical Thinking Appraisal subtests and total test. Percentile ranks were computed for freshman and sophomore students separately as well as combined. Because of the substantial sex differences found in critical thinking scores, percentile ranks were also computed for the two sexes regardless of their academic classification.

A raw score is converted to a percentile rank by locating the raw score in the first column of the table, then reading the percentile rank to the right. For example, a raw score of 50 corresponds to a percentile rank of 57 for the freshman class and 49 for the sophomore class. This means that a certain student who obtained a score of 50, performed better or as good as 57 per cent of the total freshman students and 49 per cent of the total sophomore students in the norm groups.

It appeared that in general the students in the normative samples did quite poorly in the Inference subtest. It can be seen from Table 18 that 94 per cent of the combined group had scores of 10 and below out of a possible score of

20. This may be explained by the fact that the Inference subtest calls for greater ability in reading comprehension and that the subjects were relatively handicapped in their use of the English language. In contrast, students appeared to have done better in other subtests which were less dependent on reading ability. This suggested that deficiency in English, as evidenced by the fact that a great majority of students were in remedial English programs, might have been an important factor contributing to the scores derived from the Critical Thinking Appraisal.

The reliability data of the critical thinking scores are reported in Tables 23 through 27 for the normative groups. The means, ranges of scores, standard deviations, and standard errors of measurement are also included in these tables. All reliabilities are expressed in terms of split-half reliability coefficients, which were computed by correlating the total correct scores on the odd items with the even items. The obtained coefficients were then corrected by Spearman-Brown formula to yield the reliability coefficients.

The reliability coefficients obtained for the separate subtests were rather low with a range from .11 on the Argument test to .51 on the Inference test found in the sophomore group. The reliability coefficients of the total test ranged from .55 for the females to .73 for the males. In most instances, the reliability coefficients were found to be lower than those reported in the manual. This could be expected since reliability

is a function of group variability. The fact that the ranges of ability represented in the groups were relatively narrow might partially account for the moderately low values of the obtained reliability coefficients.

The standard errors of measurements for the separate subtests as well as the total test are reported in the last column of the tables. The standard error of measurement is defined as an estimate of the root-mean-square departure of a series of observed scores from their corresponding true scores (21). The formula used in computing this statistic, as suggested by Kerlinger (41), is as follows:

$$SE_{meas} = SD_t \sqrt{1 - r_{tt}}$$

Where: SE_{meas} = standard error of measurement

SD_t = standard deviation

r_{tt} = reliability coefficient

The standard error of measurement is of particular value when it is used to indicate the spread of errors of measurement around a true score. The standard error of measurement is usually relatively independent of exact spread of scores, and, therefore, its value can be applied directly to new groups which may differ considerably in variability from the group on which the standard error of measurement was originally determined (46).

The values of the obtained standard error of measure-

ment were fairly constant from group to group. The values for the total test ranged from 4.59 to 4.86, which were slightly larger than those reported in the manual. The smaller the standard error of measurement, the more accurate the scores would be in the sense that they more closely distribute themselves around the examinee's true score. The standard error of measurement of 4.74, as reported in Table 25, would mean that for any freshman students the chances are that 68.26 percent of the time his true score would lie somewhere between 4.74 score points above or below his obtained score. Likewise, about 95 per cent of the time, his true score would fall between two standard errors of measurement, or 9.48 score points above or below his obtained score.

TABLE 17

PERCENTILE RANKS CORRESPONDING TO CRITICAL THINKING APPRAISAL TOTAL RAW SCORES

Raw Score	Percentile Rank				
	Freshman (Male & Female)	Sophomore (Male & Female)	Male (Fresh. & Soph.)	Female (Fresh. & Soph.)	Combined (All Groups)
73	99+	99+	99	99+	99+
72	99+	99+	97	99+	99+
71	99	99+	97	99+	99
70	99	99+	97	99+	99
69	99	99	97	99+	99
68	99	99	96	99+	99
67	97	99	96	99	98
66	97	98	96	98	97
65	97	98	95	98	97
64	96	97	94	98	96
63	95	95	91	96	95
62	95	95	90	97	95
61	93	94	89	96	94
60	93	91	89	95	92
59	91	87	83	92	90
58	89	86	80	92	88
57	86	82	75	87	85
56	84	77	72	86	82
55	80	72	70	82	78
54	76	69	64	79	74
53	73	63	57	77	70
52	68	57	53	71	65
51	63	55	50	66	61
50	57	49	43	60	54
49	51	46	40	55	50
48	48	39	37	50	46
47	43	36	34	45	41
46	36	28	29	36	34
45	31	22	23	31	28
44	26	18	19	26	24
43	21	14	13	22	19
42	15	12	9	16	14
41	12	9	9	12	11
40	10	8	7	10	9
39	7	6	6	7	7
38	6	4	6	6	6
37	5	4	5	5	5
36	4	3	5	5	5
35	3	2	3	3	3
34	2	2	3	1	2

TABLE 18

PERCENTILE RANKS CORRESPONDING TO CRITICAL THINKING APPRAISAL INFERENCE SUBTEST SCORES

Raw Score	Percentile Rank				
	Freshman (Male & Female)	Sophomore (Male & Female	Male (Fresh. & Soph.)	Female (Fresh. & Soph.)	Combined (All Groups)
13	99+	99+	99+	99+	99+
12	98	99	98	99	99
11	97	98	95	99	98
10	95	92	91	95	94
9	90	87	85	91	89
8	83	77	78	83	81
7	74	67	67	74	72
6	60	59	53	63	60
5	44	42	36	47	43
4	24	29	26	31	29
3	13	16	13	14	14
2	6	6	6	6	6
1	4	2	3	3	2

TABLE 19

PERCENTILE RANKS CORRESPONDING TO CRITICAL THINKING APPRAISAL ASSUMPTION SUBTEST SCORES

Raw Score	Percentile Rank				
	Freshman (Male & Female)	Sophomore (Male & Female)	Male (Fresh. & Soph.)	Female (Fresh. & Soph.)	Combined (All Groups)
15	99+	99+	99+	99+	99+
14	99	99	99	99	99
13	98	96	96	98	97
12	96	91	91	96	94
11	85	81	80	85	84
10	72	71	63	76	72
9	55	57	47	60	56
8	40	44	32	46	41
7	24	26	19	27	25
6	15	18	15	16	16
5	7	8	8	7	8
4	4	2	3	4	4
3	2-	2-	2-	2-	2-

TABLE 20

PERCENTILE RANKS CORRESPONDING TO CRITICAL THINKING APPRAISAL DEDUCTION SUBTEST SCORES

Raw Score	Percentile Rank				
	Freshman (Male & Female)	Sophomore (Male & Female)	Male (Fresh. & Soph.)	Female (Fresh. & Soph.)	Combined (All Groups)
20	99+	99+	99+	99+	99+
19	99	98	97	99	98
18	97	93	94	97	96
17	94	90	91	94	93
16	87	81	80	88	85
15	77	75	69	80	76
14	65	62	59	68	65
13	53	40	46	50	49
12	39	30	33	38	36
11	28	21	24	27	26
10	17	12	12	17	16
9	11	8	9	11	10
8	6	4	6	6	6
7	3	2	3	2	3
6	2	2	2	2	2
5	2-	2-	2-	2-	2-

TABLE 21

PERCENTILE RANKS CORRESPONDING TO CRITICAL THINKING APPRAISAL INTERPRETATION SUBTEST SCORES

Raw Score	Percentile Rank				
	Freshman (Male & Female)	Sophomore (Male & Female)	Male (Fresh. & Soph.)	Female (Fresh. & Soph.)	Combined (All Groups)
20	99+	99+	99+	99+	99+
19	99	99	97	99+	99
18	98	99	94	99+	98
17	95	96	90	98	95
16	93	91	86	95	92
15	86	83	77	89	85
14	78	72	66	81	76
13	65	61	55	69	64
12	54	50	45	57	53
11	38	35	31	40	37
10	24	20	20	24	23
9	15	11	10	15	13
8	8	6	6	8	8
7	4	2	4	3	3
6	2-	2	2	2-	2-

TABLE 22

PERCENTILE RANKS CORRESPONDING TO CRITICAL THINKING APPRAISAL ARGUMENT SUBTEST SCORES

Raw Score	Freshman (Male & Female)	Sophomore (Male & Female)	Male (Fresh. & Soph.)	Female (Fresh. & Soph.)	Combined (All Groups)
14	99+	99+	99+	99+	99+
13	99	99	99	99	99
12	96	95	92	97	96
11	88	91	83	91	89
10	79	79	74	81	79
9	65	63	60	66	64
8	48	40	45	46	46
7	34	24	29	32	31
6	17	15	17	16	17
5	10	7	11	8	9
4	5	4	6	4	5
3	2	1	2	2	2
2	1	1	1	1	1

TABLE 23

SUMMARY OF CRITICAL THINKING APPRAISAL, FORM ZM SUBTEST AND TOTAL RAW SCORES FOR FRESHMAN STUDENTS[a]

Test	Mean	Range	S.D.	Rel.[b]	S.E.m[c]
Inger.	6.1	0-16	2.6	.44	1.94
Assum.	9.1	2-16	2.3	.37	1.83
Deduc.	13.3	2-22	2.9	.41	2.13
Inter.	12.4	5-20	2.8	.41	2.15
Argum.	8.6	0-14	2.3	.44	1.72
Total	49.6	22-79	7.8	.63	4.74

a Both sex combined with N=355.
b Odd-even split-half reliability coefficients corrected by Spearman-Brown formula.
c Standard errors of measurement computed from corrected split-half reliability coefficients.

TABLE 24

SUMMARY OF CRITICAL THINKING APPRAISAL, FORM ZM SUBTEST AND TOTAL RAW SCORES FOR SOPHOMORE STUDENTS[a]

Test	Mean	Range	S.D.	Rel.[b]	S.E.m[c]
Infer.	6.3	1-13	2.7	.51	1.89
Assum.	9.1	2-16	2.5	.43	1.89
Deduc.	13.8	3-22	2.9	.35	2.34
Inter.	12.7	4-21	2.8	.32	2.31
Argum.	8.8	2-14	2.1	.11	1.98
Total	50.9	13-79	8.1	.64	4.86

a Both sex combined with N=151.
b Odd-seven split-half reliability coefficients corrected by Spearman-Brown formula.
c Standard errors of measurement computed from corrected split-half reliability coefficients.

TABLE 25

SUMMARY OF CRITICAL THINKING APPRAISAL, FORM ZM SUBTEST AND TOTAL RAW SCORES FOR MALE STUDENTS[a]

Test	Mean	Range	S.D.	Rel.[b]	S.E.m[c]
Infer.	6.1	0-14	2.7	.47	1.97
Assum.	9.4	2-16	2.5	.48	1.80
Deduc.	13.8	2-22	3.1	.43	2.34
Inter.	13.2	4-21	3.1	.43	2.34
Argum.	8.8	2-14	2.5	.46	1.84
Total	51.9	13-79	8.9	.73	4.59

a Freshman and sophomore students combined with N=172.
b Odd-even split-half reliability coefficients corrected by Spearman-Brown formula.
c Standard errors of measurement computed from corrected split-half reliability coefficients.

TABLE 26

SUMMARY OF CRITICAL THINKING APPRAISAL, FORM ZM SUBTEST AND TOTAL RAW SCORES FOR FEMALE STUDENTS[a]

Test	Mean	Range	S.D.	Rel.[b]	S.E.m[c]
Infer.	5.9	0-16	2.5	.41	1.92
Assum.	8.9	3-16	2.3	.33	1.88
Deduc.	13.2	2-22	2.8	.37	2.22
Inter.	12.2	4-20	2.5	.32	2.06
Argum.	8.6	2-15	2.1	.28	2.38
Total	49.0	13-72	7.2	.55	4.83

a Freshman and sophomore students combined with N-343.
b Odd-even split-half reliability coefficients corrected by Spearman-Brown formula.
c Standard errors of measurement computed from split-half reliability coefficients.

TABLE 27

SUMMARY OF CRITICAL THINKING APPRAISAL FORM ZM SUBTEST AND TOTAL RAW SCORES FOR FRESHMAN AND SOPHOMORE STUDENTS[a]

Test	Mean	Range	S.D.	Rel.[b]	S.E.m[c]
Infer.	6.1	0-16	2.6	.46	1.91
Assum.	9.1	2-16	2.4	.40	1.86
Deduc.	13.4	2-22	3.0	.40	2.33
Inter.	12.5	4-21	2.8	.37	2.23
Argum.	8.6	0-14	2.3	.35	1.85
Total	50.0	13-79	7.9	.64	4.80

a Both sex combined with N=506.
b Odd-even split-half reliability coefficients corrected by Spearman-Brown formula.
c Standard errors of measurement computed from corrected split-half reliability coefficients.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The problem of the study was: (1) to determine whether there were significant differences in critical thinking, dogmatism, and independence of judgment among Negro college students when classified by academic status and sex; (2) to determine whether there were significant differences among the student subgroups in the intercorrelations between critical thinking abilities, dogmatism, independence of judgment, scholastic aptitude, and grade point average; and (3) to establish norms for the Watson-Glaser Critical Thinking Appraisal based on exclusively Negro college samples.

A total of 506 students in both freshman and sophomore classes were chosen randomly as subjects for the study. All subjects were Negroes who were enrolled in a predominately Negro state college located in a southern state. As a group, the subjects came from families which were relatively deprived economically, socially, and educationally. A great majority of the students were placed in the remedial programs because of their deficiencies in English and mathematics.

The instruments administered to the subjects included

a personal data sheet, the Watson-Glaser Critical Thinking Appraisal, the Dogmatism Scale, and the Test of Independence of Judgment. The verbal and mathematics scores of the Scholastic Aptitude Test as well as grade point averages were obtained from the college's records office. The data were computed and analyzed through the help of the computer system at the University of Oklahoma.

Major findings of the study may be summarized as follows:

1. There were no statistically significant differences in critical thinking scores (subtest as well as the total raw scores) between freshman and sophomore students.

2. With academic status being held constant, the nonremedial males were found to have significantly higher mean scores in Deduction, Interpretation, and total critical thinking scores than the nonremedial females; whereas, the remedial males had significantly higher mean scores in Assumption and total critical thinking than the remedial females.

3. With sex held constant, the nonremedial males were found to have significantly higher mean scores in Inference, Deduction, Interpretation, Argument, and total critical thinking than the remedial males; whereas, the nonremedial females had significantly higher mean scores in Inference, Assumption, Interpretation, Argument, and total critical thinking than the remedial females.

4. The nonremedial females had significantly higher

mean scores in dogmatism than the nonremedial males.

5. There were no significant mean differences in dogmatism and independence of judgment between the remedial males and remedial females.

6. Nonremedial males had a significantly higher mean scores in independence of judgment, while the remedial males had significantly higher mean scores in dogmatism.

7. Remedial females had significantly higher mean scores in dogmatism than nonremedial females. No significant difference was found between the two groups in independence of judgment.

8. Differences in correlations between the nonremedial males and nonremedial females were found to be significant in Assumption-SAT(V), Assumption-SAT(M), and Assumption-Deduction in favor of the females. The males had significantly higher coefficients in the relationship between Interpretation and total critical thinking.

9. Significant differences in correlations between the remedial males and remedial females were found in GPA-SAT (V), and GPA-Inference in favor of the females.

10. Significant differences in correlations between the nonremedial males and remedial males were found in GPA-SAT(V), SAT(V)-SAT(M), SAT(V)-Assumption, Inference-Assumption, and Interpretation-Argument. With the exception of the correlation between SAT(V) and Assumption, all other differences found significant were in favor of the nonremedial group.

11. Significant differences in correlations between nonremedial females and remedial females were found in GPA-SAT(M), SAT(V)-SAT(M), Dogmatism-Independence of Judgment, and Assumption-Deduction. All differences were in favor of the nonremedial group.

12. In general, students in the sample did least well in the Inference subtest which called for greater ability in reading comprehension.

13. Split-half reliability coefficients of the Watson-Glaser Critical Thinking Appraisal ranged from .55 for the females to .73 for the males. The reliability coefficients were relatively low as compared to those reported in the manual.

Recommendations

In light of the findings, the following recommendations are made:

1. A subtest scores on the WGCTA may not be useful in evaluating individual attainment in any single sub-skill of critical thinking due to the moderately low subtest reliabilities. It is recommended that the total critical thinking score be utilized whenever the evaluation of individual performance is desired.

2. On the average, the students in the study were relatively hampered in making inference. Therefore, the development of ability to make inference is the type of

critical thinking training that is most needed by the group.

3. The rather low and even negative correlations between grade point average and SAT scores found for the two remedial groups suggests that there is a need for the institution to reconsider the value of the Scholastic Aptitude Test for the purpose of predicting academic achievement insofar as the remedial students are concerned.

4. It is recommended that further studies be carried out to establish norms for Negro students on other important standardized tests. It is further recommended that Negro educators develop and standardize some aptitude tests which are appropriate for this segment of the population.

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APPENDIX A

PERSONAL DATA SHEET

APPENDIX A

PERSONAL DATA SHEET

For statistical purposes, please supply the following information:

1. Name:_____

2. Sex: Male_____ Female_____

3. Marital Status: Single_____ Married_____

4. Date of Birth: _____ _____ _____
   Month Day Year

5. Classification: Freshman_____ Sophomore_____
   Other (specify) _____

6. What is your religious affiliation?
   Protestant_____(Specify denomination)_____
   Catholic_____ Other (specify)_____ None_____

7. Are(were) you required to take remedial English?
   Yes_____ No_____

8. Are(were) you required to take remedial mathematics?
   Yes_____ No_____

9. What is your father's occupation? (Specify)_____

10. What was the last grade <u>your father</u> completed in that school or college? (Circle one)

Grammer				High School				College			
0-5	6	7	8	9	10	11	12	1	2	3	4

Graduate School
1 2 3

11. What was the last grade <u>your mother</u> completed in that school or college? (Circle one)

Grammar				High School				College			
0-5	6	7	8	9	10	11	12	1	2	3	4

Graduate School
1 2 3

12. What is the total amount of your family yearly income? (Approximately) _____

APPENDIX B

THE DOGMATISM SCALE

APPENDIX B

THE DOGMATISM SCALE

The following is a study of what the general public thinks and feels about a number of important social and personal questions. The best answer to each statement below is your personal opinion. We have tried to cover many different and opposing points of view; you may find yourself agreeing strongly with some of the statements, disagreeing just as strongly with others; whether you agree or disagree with any statement, you can be sure that many people feel the same as you do.

Mark each statement in the left margin according to how much you agree or disagree with it. Please makr every one. Write +1, +2, +3, or-1, -2, -3, depending on how you feel in each case.

+1:	I AGREE A LITTLE	-1:	I DISAGREE A LITTLE
+2:	I AGREE ON THE WHOLE	-2:	I DISAGREE ON THE WHOLE
+3:	I AGREE VERY MUCH	-3:	I DISAGREE VERY MUCH

_____ 1. The United States and Russia have just about nothin in common.

_____ 2. The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent.

_____ 3. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.

_____ 4. It is only natural that a person would have a much better acquaintance with ideas he believes in than the ideas he opposes.

_____ 5. Man on his own is a helpless and miserable creature.

_____ 6. Fundamentally, the world we live in is a pretty lonesome place.

_____ 7. Most people just don't give a "damn" for others.

_____ 8. I'd like it if I could find someone who would tell me how to solve my personal problems.

_____ 9. It is only natural for a person to be rather fearful of the future.

_____ 10. There is so much to be done and so little time to do it in.

_____ 11. Once I get would up in a heated discussion I just can't stop.

_____ 12. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.

_____ 13. In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what the others are saying.

_____ 14. It is better to be a dead hero than be a live coward.

_____ 15. While I don't like to admit this even to myself, my secret ambition is to become a great man, like Einstein, or Beethoven, or Shakespeare.

_____ 16. The main thing is life is for a person to want to do something important.

_____ 17. If given the chance, I would do something of great benefit to the world.

_____ 18. In the history of mankind there have probably been just a handful of really great thinkers.

_____ 19. There are a number of people I have some reason to hate because of the things they stand for.

_____ 20. A man who does not believe in some great cause has not really lived.

_____ 21. It is only when a person devotes himself to an ideal or cause that life becomes meaningful.

_____ 22. Of all the different philosophies which exist in this world there is probably only one which is correct.

_____ 23. A person who gets enthusiastic about too many causes is likely to be a pretty "wishy-washy" sort of person.

_____ 24. To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.

_____ 25. When it comes to differences of opinion in religion we must be careful not to compromise with those who believe differently from the way we do.

_____ 26. In times like these, a person must be pretty selfish if he considers primarily his own happiness.

_____ 27. The worst crime a person could commit is to attack publicly the people who believe in the same thing he does.

_____ 28. In times like these it is often necessary to be more on guard against ideas put out by people or groups in one's own camp than by those in the opposing camp.

_____ 29. A group which tolerates too much differences of opinion among its own members cannot exist for long.

_____ 30. There are two kinds of people in this world: those who are for the truth and those who are against the truth.

_____ 31. My blood boils whenever a person stubbornly refuses to admit he's wrong.

_____ 32. A person who thinks primarily of his own happiness is beneath contempt.

_____ 33. Most of the ideas which get printed nowadays aren't worth the paper they are printed on.

_____ 34. In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.

_____ 35. It is often desirable to reserve judgment about what's going on until one has a chance to hear the opinions of those one respects.

_____ 36. In the long run the best way to live is to pick friends and associates whose tastes and beliefs are the same as one's own.

_____ 37. The present is all too often full of unhappiness. It is only the future that counts.

_____ 38. If a man is to accomplish his mission in life, it is sometimes necessary to gamble "all or nothing at all."

_____ 39. Unfortunately, a good many people with whom I have discussed important social and moral problems don't really understand what's going on.

_____ 40. Most people just don't know what's good for them.

APPENDIX C

TEST OF INDEPENDENCE OF JUDGMENT

APPENDIX C

TEST OF INDEPENDENCE OF JUDGMENT

Please circle either True(T) or False(F) for each of the following statements.

1.	I would enjoy the experience of living and working in a foreign country.	T	F
2.	I prefer team games to games in which one individual competes against another	T	F
3.	The unfinished and the imperfect often have greater appeal for me than the completed and the polished.	T	F
4.	Disobedience to the government is never justified.	T	F
5.	I could cut my morrings . . . quit my home, my parents and my friends . . . without suffering great regrets.	T	F
6.	Things seem simpler as you learn more about them.	T	F
7.	When a person has a problem or worry, it is best for him not to think about it, but to keep busy with more cheerful things.	T	F
8.	Perfect balance is the essence of all good composition.	T	F
9.	Politically, I am probably something of a radical.	T	F
10.	Kindness and generosity are the most important qualities for a wife to have.	T	F
11.	An invention which takes jobs away from people should be suppressed until new work can be found for them.	T	F
12.	I think I take primarily an esthetic view of experience.	T	F
13.	It is a pretty callous person who does not feel love and gratutude toward his parents.	T	F
14.	When someone talks against certain groups of nationalities, I always speak up against such talk, even though it makes me unpopular.	T	F
15.	It is the duty of a citizen to support his country, right or wrong.	T	F
16.	Barring emergencies, I have a pretty good idea what I'll be doing for the next ten years.	T	F
17.	Many of my friends would probably be considered unconventional by other people.	T	F
18.	I don't like modern art.	T	F
19.	Some of my friends think that my ideas are impractical, if not a bit wild.	T	F

20.	I much prefer symmetry to asymmetry.	T	F
21.	Straightforward reasoning appeals to me more than metaphors and the search for analogies.	T	F
22.	I enjoy discarding the old and accepting the new.	T	F

APPENDIX D

FREQUENCY DISTRIBUTION OF SCORES ON THE SCHOLASTIC APTITUDE TEST

APPENDIX D

FREQUENCY DISTRIBUTION OF SCORES ON THE SCHOLASTIC APTITUDE TEST

Class Interval	Verbal		Mathematics	
	Male	Female	Male	Female
400+	9	7	22	18
390-399	1	1	5	1
380-389	2	6	3	6
370-379	3	8	2	1
360-369	3	3	4	9
350-359	2	4	2	9
340-349	9	9	12	12
330-339	5	10	4	16
320-329	12	10	11	19
310-319	5	19	18	48
300-309	10	17	21	31
290-299	14	12	14	29
280-289	20	34	14	30
270-279	21	44	13	22
260-269	12	24	4	20
250-259	9	25	8	15
240-249	7	23	6	27
230-239	6	22	5	9
220-229	6	19	0	3
210-219	9	19	1	6
200-209	7	18	3	3

APPENDIX E

FREQUENCY DISTRIBUTION OF SCORES ON THE DOGMATISM SCALE FORM E

APPENDIX E

FREQUENCY DISTRIBUTION OF SCORES ON THE DOGMATISM SCALE FORM E

Class Interval	Frequency	
	Male	Female
239-247	1	1
230-238	3	3
221-229	2	7
212-220	10	17
193-211	30	76
184-192	25	51
175-183	20	61
166-174	26	38
157-165	21	32
148-156	14	26
139-147	7	9
130-138	6	8
121-129	4	4
112-120	2	1
103-111	1	0

APPENDIX F

FREQUENCY DISTRIBUTION OF SCORES ON THE TEST OF INDEPENDENCE OF JUDGMENT

APPENDIX F

FREQUENCY DISTRIBUTION OF SCORES ON THE TEST OF INDEPENDENCE OF JUDGMENT

Class Interval	Frequency	
	Male	Female
31+	1	
29-30	1	1
27-28	3	2
25-26	6	8
23-24	14	20
21-22	18	30
19-20	23	35
17-18	32	67
15-16	22	55
13-14	24	43
11-12	13	38
9-10	11	18
7-8	4	12
5-6		3
3-4		2

APPENDIX G

FREQUENCY DISTRIBUTION OF GRADE POINT AVERAGES

APPENDIX G

FREQUENCY DISTRIBUTION OF GRADE POINT AVERAGES

Class Interval	Frequency	
	Male	Female
3.70-3.89		2
3.50-3.69	2	4
3.30-3.49	3	2
3.10-3.29	0	8
2.90-3.09	4	19
2.70-2.89	8	16
2.50-2.69	4	31
2.30-2.49	22	37
2.10-2.29	20	50
1.90-2.09	43	55
1.70-1.89	17	38
1.50-1.69	18	25
1.30-1.49	12	24
1.10-1.29	8	9
0.90-1.09	4	9
0.70-0.89	4	1
0.50-0.69	1	1
0.30-0.49	2	1
0.10-0.29		2